

# Two New Species of *Metula* (Gastropoda: Buccinidae) with a Description of the Radula of the Genus

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## ABSTRACT

Two species of *Metula* H. and A. Adams, 1853, lack a radula, and it is very small in a third species. The morphology of the teeth is significantly different from that in *Pisania*, and the two genera are probably not closely related. *Metula crosnieri* new species, from 400–450 m off SW Madagascar, is a large, broad species, with very convex whorls and a deep suture. *Metula africana* new species, from the deep continental shelf off West Africa, is considered the descendant of the Mediterranean Pliocene *M. mitraeformis* (Brocchi, 1814). This lineage cannot be taken as evidence for Mediterranean–Indo-Pacific connections in the lower Pliocene as claimed by Grecchi (1978).

## INTRODUCTION

The chequered taxonomical history of the generic name *Metula* H. and A. Adams, 1853, has recently been stabilized by Emerson (1986), who clarified the identity of its type species, *Buccinum clathratum* Adams and Reeve, 1850. Additional information was provided by Beu and Maxwell (1987).

The familial position of the genus has been the subject of a controversy between Ponder (1968, 1973) and Cernohorsky (1971). Ponder (1968) described the anatomy of *Ratifusus* Iredale, 1919, and *Iredalula* Finlay, 1927; he concluded that their peculiar glandular mid-esophagus as well as other features of the anterior alimentary canal justified their inclusion in the family Colubrariidae, which he considered to be anatomically distinct from the Buccinidae. Cernohorsky (1971) regarded the presence of a vestigial radula in *Ratifusus* and *Iredalula* to indicate placement in the Buccinidae, since the species of Colubrariidae have no radula at all, and he suggested a placement in the buccinid subfamily Pisaniinae. This view has been accepted by most subsequent authors dealing with *Metula* (Olsson and Bayer, 1972; Kilburn, 1975; Houbriek, 1984; Emerson, 1986), who apparently overlooked Ponder's (1973) refutation of Cernohorsky's point of view. Ponder (1973) confirmed that *Ratifusus*, *Iredalula*, and *Colubraria* shared the same anatomical characters that separate them from the Buccinidae, and commented on the radular differences: "It thus appears that some Colubrariidae have lost the radula and that it is

relatively small or vestigial in the remainder. It is possible that the whole *Metula-Ratifusus* series discussed by Cernohorsky (1971) belongs in the Colubrariidae as they all have similar shell features" (Ponder, 1973:328).

The family Colubrariidae is treated as a synonym of Buccinidae by Ponder and Warén (1988), while Beu and Maxwell (1987) recognize a subfamily Pisaniinae, where they include *Metula*, *Colubraria*, and a number of other genera.

The purpose of the present paper is to provide a name for the West African species that has been known in the recent literature as *Metula clathrata* Adams and Reeve, and to describe another new *Metula* from the upper continental slope in the Mozambique channel. Several additional Indo-Pacific species of *Metula*, now under study, can be distinguished only on the basis of their protoconch, which has already been emphasized by Alena (1949) as a taxonomical character.

## SYSTEMATICS

The radula of a species of *Metula* is figured here for the first time (figure 1). It is very small for a buccinid (ribbon 25  $\mu\text{m}$  wide; central tooth 6.5  $\mu\text{m}$  wide, lateral teeth 12  $\mu\text{m}$  wide) and very similar to the radulae of *Ratifusus* and *Iredalula* figured by Ponder (1968): the central tooth has a narrow arched basal plate with 3 long, slender, and equal cusps; the lateral teeth also have a narrow basal plate and 3 long slender cusps, the outermost one being longest.

A radula has been looked for, but not found in *Metula amosi* Vanatta, 1913, and *M. cumingi* (Adams, 1853); several specimens were examined in each case by A. Warén (personal communication). I do not consider presence or absence of this very reduced radula to be of generic importance.

The radula (figure 2) of *Pisania striata* (Gmelin, 1791), type species of *Pisania*, is 150  $\mu\text{m}$  wide; it differs in having a central tooth with a large square basal plate and 5 short and broad cusps, the outermost 2 being smaller; the lateral teeth are more strongly built, with 3 unequal cusps.

In view of the small variation of radular types in buc-

cinids, this difference is remarkable and probably indicates that the two genera are not closely related. Whatever rank (subfamily or tribe) the *Pisania* group is given in Buccinidae, additional research is needed before the *Colubraria* group is considered a mere synonym of it.

## DESCRIPTIONS

[For a diagnosis of the genus see Altena (1949) as *Antemetula*.]

*Metula crosnieri* new species  
(figures 3–5, 9)

**Description:** Shell solid, fusiform, consisting of 2.5 protoconch and 6.2 teleoconch whorls. Spire high, body whorl comprising 64% of total shell height. Protoconch (figure 9) with large nucleus of two smooth convex whorls abruptly demarcated from teleoconch. Teleoconch whorls convex, without sutural ramp, with deeply impressed suture. Sculpture of raised spiral cords and curved opisthocline axial ribs; cords and ribs producing beaded intersections and pitted intervals. Eight spiral cords on spire whorls; 4 minor, intermediate cords on penultimate whorl; about 18 cords above periphery of body whorl, principal and secondary cords alternating rather regularly, and 33 cords below periphery, of which about 15 are set close together in siphonal region. Axial ribs about equal in strength to spiral cords on spire whorls; weaker on penultimate whorl, with main sculpture being spiral on body whorl. In addition to axial ribs, several incremental scars are obvious, especially on body and penultimate whorls. Aperture ovate; inner lip thin, smooth, adherent to body whorl, thicker in columellar region; outer lip bearing 12 very weak teeth that do not correspond with position of external spiral cords; two most apical teeth slightly stronger. Peristome thickened, forming broad varix, also covered by spiral cords. Siphonal canal long, broad, widely open, and recurved. Fasciole indistinct.

Colour light tan, with a very indistinct darker spiral band at periphery of body whorl; incremental scars lighter; aperture white.

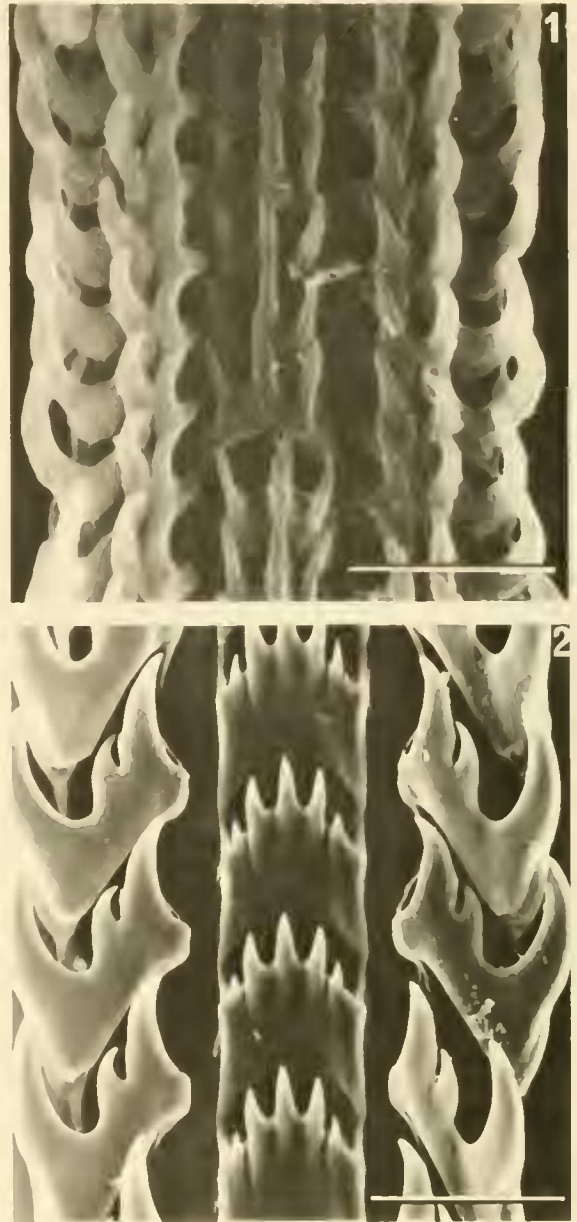
**Dimensions of the holotype:** Height 51.3 mm, width 19.4 mm; height of the aperture 24.5 mm, width 8 mm; height of the body whorl 33 mm.

The largest paratype is 55.4 mm high.

**Type locality:** Mozambique channel, SW Madagascar, off Baie de Fanemotra, 22°15'S, 43°05'E, 470–475 m.

**Type material:** Holotype and paratype 1 (MNHN) from the type locality, collected by A. Crosnier, Dec. 2, 1973 aboard R.V. "Vauban"; paratype 2 (MNHN), Mozambique channel, SW Madagascar, 22°17'S, 43°04'E, 400–450 m, collected by R. v. Cosel, Nov. 30, 1986 aboard trawler "Mascareignes III".

**Distribution:** Known only from the type material, off SW Madagascar.



Figures 1, 2. Scanning electron micrographs of radulae. 1. *Metula africana* new species, scale bar 10  $\mu$ m. 2. *Pisania striata* (Gmelin, 1791), scale bar 50  $\mu$ m.

**Remarks:** *Metula crosnieri* has remarkably convex whorls and a deep suture when compared with its congeners. The protoconch (figure 9) indicates non-placotrophic larval development. The combination of these two characters distinguishes it from all known Indo-Pacific *Metula*.

In the Atlantic, *Bartschia significans* Rehder, 1943, type species of *Bartschia* Rehder, 1943, has even more convex whorls, and a multispiral protoconch. I cannot find characters other than the convexity of the whorls that sharply distinguish *Bartschia* from *Metula*, and conclude that *Bartschia* should be considered at most a subgenus of *Metula*.

I am naming this species after my colleague Alain Crosnier, who first collected it during a survey of deep water shrimp populations off Madagascar.

*Metula africana* new species  
(figures 1, 6–8, 10)

*Metula clathrata* Knudsen, 1956:39, plate 1, figure 1; non *M. clathrata* (Adams and Reeve, 1850).  
non *Metula knudseni* Kilburn, 1975:592 (replacement name for *Buccinum clathratum* Adams and Reeve, 1850: see Emerson, 1986).

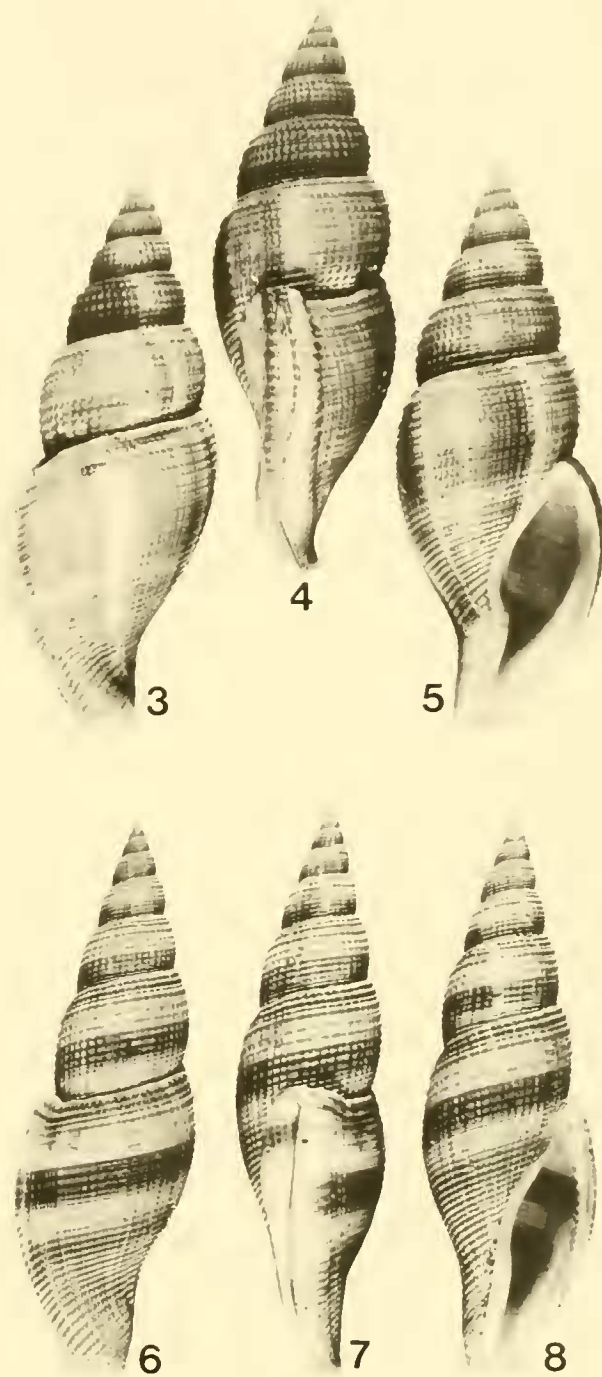
**Description:** Shell solid, fusiform, consisting of 7 teleoconch whorls. (Protoconch of holotype partly broken, on a paratype consisting of large nucleus and 1.5 smooth convex whorls, figure 10.) Teleoconch whorls convex, with faint but distinct sutural ramp on early whorls; ramp indistinct on penultimate whorl, body whorl evenly convex. Teleoconch sculpture of raised spiral cords and slightly curved opisthocline axial ribs; intersections distinctly beaded in sutural ramp area, only slightly nodulous below ramp. Spiral and axial sculpture of similar strength on early whorls; later spiral sculpture gradually dominates. Nine primary spiral cords per whorl on spire whorls, first (adapical) and third cords stronger, limiting sutural ramp. Fine spiral threads present between cords on penultimate and body whorl, several eventually developing into secondary spiral cords, with one present in sutural ramp area of body whorl. About 22 primary cords below periphery of body whorl, plus another 10 in siphonal area. Incremental scars distinct; growth lines very distinct between axial ribs. Aperture ovate, narrow. Inner lip thin, smooth, adherent to body whorl, thicker in columellar region. Outer lip regularly convex, bearing small teeth that correspond at least partly with position of spiral cords on peristome; a group of 5 teeth forms a small callus in apical portion of outer lip, delimiting small anal canal. Peristome forming a thickened varix, over which spiral sculpture extends. Siphonal canal short, narrow, open, only slightly recurved.

Ground colour of shell beige cream, with 3 brown spiral bands; 3 adapical cords brown, interval between them beige cream. Below, uniformly beige band extends over next 2 spiral cords, occupies central position on spire whorls. Darkest band occupies next 4 spiral cords and intervals between them; this band occupying suprasutural position on spire whorls, and a central position on body whorl. Below brown band a second beige band extends over 4 spiral cords; next 2 cords brown, with brown colour fading towards base of shell. Aperture cream colored.

**Dimensions of the shell:** Height 54.5 mm, width 17.5 mm; height of the aperture 27 mm, width 7 mm; height of the body whorl 35 mm.

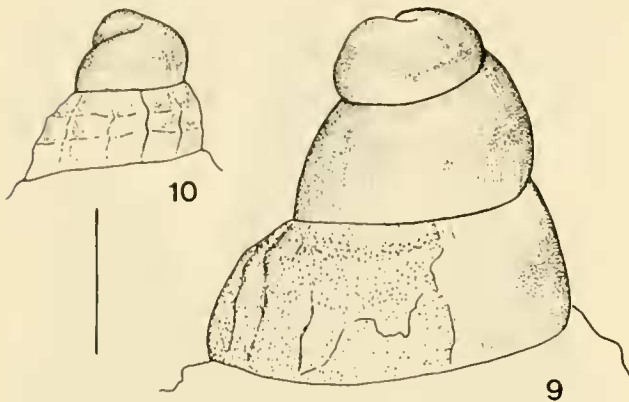
**Type locality:** Off Saint Louis, Sénégal, in 300–600 m.

**Type material:** Holotype (MNHN), paratype 1 (MNHN) and paratype 2 (AMNH 198755), all from the type locality, collected by M. Pin on the trawler "Louis Sauger".



Figures 3–8. Back, side, and front views. 3–5. *Metula crosnieri* new species, holotype, 51.3 mm. 6–8. *Metula africana* new species, holotype, 54.5 mm.

**Other material examined:** SENEGAL: off Saint Louis, "deep water", 4 shells (MNHN, leg. M. Pin), 10 shells (coll. M. Pin, Dakar); IVORY COAST: off Abidjan, 1 shell, coll. Marche-Marchad (MNHN), and 1 shell, P. Le Loeuff coll. (MNHN); EQUATORIAL GUINEA: Atlantic Sta. 120, 02°09'N, 09°27'E, 250–850 m, 1 specimen



Figures 9, 10. Protoconchs. 9. *Metula crosnieri*. 10. *Metula africana*. Scale line 1 mm.

(Knudsen, 1956) (ZMC); CONGO: West of Pointe-Noire, 100 m, 1 shell, A. Crosnier coll. 1962 (ANSP 333810).

**Distribution:** Deep continental shelf and upper slope of West Africa, from Senegal to Congo.

**Remarks:** *Metula africana* has been figured three times in the literature: by Knudsen (1956: plate 1, figure 1) under the name *Metula clathrata*; by Emerson (1986: figures 4, 5) as *Metula* sp.; finally by Kaicher (1987: card 4851) as *Metula* sp. I refer to Emerson (1986) who reviewed the nomenclature of this West African *Metula* and concluded that it represents a new species.

The protoconch (figure 9) indicates non-planctotrophic larval development.

There may be clinal variation in adult size along the West African coast: The 18 shells examined from Senegal have a mean height of 41.7 mm; the 2 shells from Ivory Coast, although fully adult, measure 32 and 36 mm; that from Equatorial Guinea is 30.6 mm high, and that from Congo 25.5 mm.

The tiny rachiglossate radula (figure 1) was prepared from the specimen taken during the Atlantide expedition (ZMC).

The close connection between Mediterranean Pliocene and Recent West African marine faunas has been demonstrated in a number of paleontological papers (for recent reviews see Ruggieri, 1967; Marasti and Raffi, 1979; Sabelli and Taviani, 1984). With a single species of *Metula* present in the Pliocene of Italy and a single Recent species in West Africa, it is reasonable to assume that *Metula mitraeformis* (Brocchi, 1814) (for figures and references see Pelosio, 1966) is the direct ancestor to *M. africana*. I have examined material of the fossil species and found it to differ from the Recent one by its much weaker axial sculpture, which on the body and penultimate whorls is limited to growth lines. In *M. mitraeformis*, there is a very broad sutural ramp that extends over the adapical third or half of early teleoconch whorls, and becomes obsolete on the penultimate and body whorls; the siphonal canal is also broader.

Because he was mistaken about the identity, type lo-

cality, and distribution of *M. clathrata*, Grecchi (1978) speculated that the presence of its presumed ancestor *M. mitraeformis* in the Mediterranean Pliocene was an indication of Mediterranean-Indo-Pacific connections in the lower Pliocene after the Messinian salinity crisis. With *M. clathrata* now known to be a West American species distinct from *M. africana*, the history of the *M. mitraeformis-africana* lineage can not be taken as an indication of such connections. This lineage probably has an Eastern Atlantic history dating to the Miocene; although the Neogene West African fossil record is lacking, it is far more probable that *M. mitraeformis* reinvaded the Pliocene Mediterranean from West Africa rather than from the Indo-Pacific through unproven maritime connections.

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